
LD 96: D-channel Diagnostic

LD 96 is used to test and maintain D-channel links and the QPC757 or NT6D11AB D-channel Interface (DCHI) card.

In Release 18, D-channels can also reside on Multi-purpose Serial Data Link (MSDL) cards. A new set of LD 96 commands are provided to support MSDL cards. The MSDL commands listed in LD 48 can also be used in LD 96.

Note: In Release 18, all commands accept “DCH” instead of “DCHI.” For example, use ENL DCH x rather than ENL DCHI x.

Monitoring

D-channel message monitoring is used to analyze the Layer 3 protocol messages traveling between the near and far-end D-channels.

Up to and including Release 16, message monitoring can be performed only on a per D-channel basis using LD 96. That is, once the message monitor is turned on, all messages are output for that D-channel. The messages output might be excessive.

Release 17 provides additional commands in LD 96 that allows selective message monitoring based on

- the D-channel
- the B- or ISL channel
- the message types for a specific feature
- any specific message

The following sections describe the various command formats.

Note 1: During high traffic some of the monitored messages may be lost.

Note 2: For the D-channel monitor messages to be displayed, the system terminal must have USER defined as MTC in LD 17 (Release 17 and later).

D-channels

All message types, features and channels associated with a particular D-channel can be monitored. Up to and including Release 16, only one D-channel can be monitored for outgoing messages and one for incoming messages. Release 17 and later allows the monitoring of multiple D-channels for both incoming and outgoing messages.

The LD 96 commands to enable or disable monitoring of all incoming or outgoing messages on a D-channel are:

ENL MSGI x—enable monitoring of incoming messages
ENL MSGO x—enable monitoring of outgoing messages
DIS MSGI x—disable monitoring of incoming messages
DIS MSGO x—disable monitoring of outgoing messages

Where x is the DCHI or MSDL port address (I/O address). For example, to enable monitoring of incoming messages on D-channel 5, enter:

ENL MSGI 5

The output includes all messages, features and channels for D-channel 5.

B-channels and ISL channels

You can monitor up to 5 ISL or B-channels, for each direction. If there is no specific channel selected, all channels are monitored. The commands follow:

For B-channels on all systems except Option 11:

```
ENL MSGI x CH loop channel
ENL MSGO x CH loop channel
DIS MSGI x CH loop channel
DIS MSGO x CH loop channel
```

For B-channels on Option 11 systems:

```
ENL MSGI x CH card channel
ENL MSGO x CH card channel
DIS MSGI x CH card channel
DIS MSGO x CH card channel
```

For ISL channels on all systems except Option 11:

```
ENL MSGI x CH l s c u
ENL MSGO x CH l s c u
DIS MSGI x CH l s c u
DIS MSGO x CH l s c u
```

For ISL channels on Option 11 systems:

```
ENL MSGI x CH c u
ENL MSGO x CH c u
DIS MSGI x CH c u
DIS MSGO x CH c u
```

Where:

```
ENL = enable monitoring
DIS = disable monitoring
MSGI = incoming messages
MSGO = outgoing messages
```

ISDN features

You can select specific ISDN applications, such as Network Ring Again, for message monitoring. Only one or all ISDN applications can be monitored per D-channel at one time. The LD 96 commands are listed below, where x is the D-channel (DCHI or MSDL) port number.

ENL MSGI x FEAT feature
ENL MSGO x FEAT feature
DIS MSGI x FEAT feature
DIS MSGO x FEAT feature

Where “feature” can be:

NCT = Network Call Trace
NRAG = Network Ring Again
NACD = Network Automatic Call Distribution
TRO = Trunk Optimization
NMS = Network Message Services
OHQ = Offhook Queuing
RCFW = Network Remote Call Forward
NRPA = Network Radio Paging
NITC = Network Intercom
TAT = Trunk Anti-Tromboning

Message types

You can select specific types of messages to be monitored on a D-channel. The LD 96 commands are listed below, where **x** is the D-channel (DCHI or MSDL) port number.

```
ENL MSGI x MSG msg1 msg2 msg3
ENL MSGO x MSG msg1 msg2 msg3
DIS MSGI x MSG msg1 msg2 msg3
DIS MSGO x MSG msg1 msg2 msg3
```

Up to three message types (msg1, msg2, msg3) can be entered per command. The default is “ALL”, which is all message types except SVC and SVCA. The message types are:

- 1** ALER = alerting
- 2** ALL = all primitives and all messages except SVC and SVCA
- 3** CAPR = call proceeding
- 4** CON = connect
- 5** CONA = connect ack
- 6** DISC = disconnect
- 7** FAC = facility
- 8** FACA = facility ack
- 9** FACR = facility reject
- 10** INFO = information
- 11** NOTF = notify
- 12** PRIM = all primitives (such as release indication)
- 13** PROC = call proceeding
- 14** PROG = progress
- 15** RLS = release
- 16** RLSC = release complete
- 17** RST = restart
- 18** RSTA = restart ack

- 19 STAT = status
- 20 STEN = status enquiry
- 21 STP = setup
- 22 STPA = setup ack
- 23 SVC = service
- 24 SVCA = service ack
- 25 UI = user information

Setting output format levels

There are three levels (0-2) of message decoding. The level determines the format of the data output to the system terminal. To set the output level enter the following.

```
SET MSGI x MON (0)-2
SET MSGO x MON (0)-2
```

Level 0 outputs the message as shown below.

DCH x y MSG msgtype REF xxxxxxxx CH zzzz TOD hh:mm:ss <more data>

Where:

x = D-channel number
y = "I" for incoming messages, "O" for outgoing messages
xxxxxxx = the call reference number
zzzz = the loop and channel number (or TN for ISL channels)

<more data> = additional lines of information, such as:

- 1 CALLED # = called number
- 2 CALLING # = calling number of originator
- 3 CAUSE = reason for action taken (e.g, unassigned number)
- 4 CONNECT # = connected number
- 5 FEAT = feature (such as Network Ring Again)
- 6 NUM PLAN = Numbering plan used (such as private)

- 7** PROGRESS = call progress description
- 8** REDIR REASON = reason the call was re-directed
- 9** REDN # = call redirection number
- 10** STATE = call state
- 11** STATUS = channel status
- 12** TYPE = type of channel

Level 1 outputs the raw data (as was done in X11 Release 16).

The format is:

DCH x y MSG msgtype REF xxxxxxxx TN zzzzzz CH# x CK x
<more data in hexadecimal>

Level 2 output identifies the individual Information Elements (IE) in the messages and their hexadecimal values. The possible IEs are:

- 1 BCAP = bearer capability
- 2 CAST = call state
- 3 CHGA = charge advice
- 4 CHID = channel ID
- 5 CHST = change status
- 6 CLED = called number
- 7 CLES = called party subaddress
- 8 CLNG = calling number
- 9 CLNS = calling party subaddress
- 10 CNS5 = codeset 5 connected number subaddress
- 11 CON# = connect number
- 12 CON5 = codeset 5 connected number
- 13 CSE = cause
- 14 DES6 = codeset 6 Destination IE
- 15 DISP = display
- 16 FAC = facility IE for codeset 0
- 17 FAC6 = codeset 6 facility IE
- 18 FIND = feature Indication
- 19 HLYR = higher layer compatibility
- 20 INFO = information request

- 21** KYPD = keypad
- 22** LLYR = low layer compatibility
- 23** LS5 = locking Shift to codeset 5
- 24** LS6 = locking shift to codeset 6
- 25** LS7 = locking Shift to codeset 7
- 26** NLS5 = codeset 5 non-locking shift
- 27** NLS6 = codeset 6 non-locking shift
- 28** NLSO = non-locking shift to codeset 0
- 29** NOTI = notify indicator
- 30** NSF = network specific facility
- 31** ORG# = originating called number
- 32** ORG6 = codeset 6 Originating IE
- 33** PROG = progress indicator
- 34** RDG6 = codeset 6 redirecting number
- 35** REDG = redirecting number
- 36** REDN = redirection number
- 37** RETR = codeset 6 reason for return
- 38** RSTI = restart indicator
- 39** SHFT = shift
- 40** SIGN = signal
- 41** TACG = codeset 6 TTC advice charge
- 42** TNS = transit network selection
- 43** UNKN = unknown
- 44** UUI = user-user information

Deactivate monitor from a maintenance telephone

Once the system has been tied up or flooded with the monitored messages, it is very difficult, if not impossible, to use LD 96 to disable the monitors. In this case, a maintenance telephone with MTA Class of Service can be used to deactivate the monitor.

To activate or deactivate the monitor from a maintenance telephone, simply dial: SPRE 9913 x 01

Where:

SPRE = special function access code (defined in LD 15)

9913 = feature code to activate or deactivate the monitor

x = 0 to deactivate, 1 to activate

01 = DCH monitor ID

Note 1: Dial tone is provided if successful.

Note 2: Use “RST MON” to reactivate the monitor from LD 96.

Note 3: Deactivating the monitor by the maintenance telephone does not disable the monitor, but simply halts the output. If the monitor is deactivated and not disabled using the DIS MSGI and DIS MSGO commands, then the monitor becomes re-activated after a datadump and sysload.

Get monitor status

To determine the current status of the D-channel monitor, enter the following command, where x is the D-channel (DCHI or MSDL) port number.

STAT MON x

Output format:

***DCH MSGI x LEVEL y ACTV (where, y = format level)

MSG - msg1 msg2. . .

FEAT - feat

CH - loop channel (or l s c u for ISL)

***DCH MSGO x LEVEL y ACTV

MSG - msg1 msg2. . .

FEAT - feat

CH - loop channel (or l s c u for ISL)

If the monitor had been deactivated by the maintenance telephone, INACTV is output instead of ACTV.

Multi-purpose Serial Data Link (MSDL)

The MSDL provides 4 ports for ISDN Primary Rate D-channel (DCH) and Application Module Link (AML).

The MSDL commands are listed below, x is the MSDL device number (defined by prompt DNUM in LD 17).

DIS MSDL x (ALL)—Disable MSDL device

ENL MSDL x (FDL, ALL)—Enable MSDL device

RST MSDL x—Reset MSDL device

STAT MSDL (x) (FULL)—Get MSDL status

SLFT MSDL x—Execute a self-test on MSDL device x

These commands are also provided in Input/Output Diagnostic (LD 37) and Link Diagnostic (LD 48).

D-channel commands (pre-Release 18)

The following commands are used to enable, disable, test and get the status of a D-channel. Refer to the LD 96 introduction for details on the use of these commands.

In X11 Release 18 all commands now accept "DCH" instead of "DCHI." For example: use "ENL DCH x" instead of "ENL DCHI x." The STAT DCH and STAT DCHI commands have been combined to STAT DCH.

DIS AUTO x	Disable automatic recovery for DCH x
DIS DCHI x	Disable DCHI x
DIS MSGI x	Disable the monitoring of all incoming messages from D-channel x
DIS MSGI x (options)	Disable the monitoring of incoming messages from D-channel x for the selected options (Release 17)
DIS MSGO x	Disable the monitoring of all outgoing messages from D-channel x
DIS MSGO x (options)	Disable the monitoring of outgoing messages for D-channel x for the selected options (Release 17)
DIS SERV x	Disable service messages on D-channel x
DIS SSM x y	Disable Supplementary Service Monitor for feature y on D-channel x
DWNL DCHI x (t)	Down load layer 3 message configuration table t and LAPD parameters from DCHI x
ENL AUTO x	Enable automatic recovery for DCH x
ENL DCHI x	Enable DCHI port x
ENL MSGI x	Enable the monitoring of all incoming messages from D-channel x (Release 16 and earlier)
ENL MSGI x (options)	Enable the monitoring of incoming messages from D-channel x for the selected options (Release 17)
ENL MSGO x	Enable the monitoring of all outgoing messages for D-channel x (Release 16 and earlier)
ENL MSGO x (options)	Enable the monitoring of outgoing messages for D-channel x for the selected options (Release 17)
ENL SERV x	Enable service messages on D-channel x
ENL SSM x y	Enable Supplementary Service Monitor for feature y on D-channel x
EST DCH x	Establish multiple frame operation on D-channel x

PLOG DCHI x	Get D-channel statistics log for DCHI x (Print protocol error log on DCH x)
PTAB DCHI x (t)	Display layer 3 message configuration table t and LAPD parameters from DCHI x
RLS DCH x	Release D-channel x
RST DCH x	Reset D-channel x, inhibit signaling
RST MON	Reset or reactivate monitoring on D-channels with enabled monitors
SDCH DCH x	Switch to the standby D-channel x
SET MSGI x MON (0)-2	Set monitor output format level for incoming messages on D-channel x
SET MSGO x MON (0)-2	Set monitor output format level for outgoing messages on D-channel x
STAT DCH (x)	Get status of D-channel x or all D-channels if x not specified
STAT DCHI (x)	Get status of DCHI port x or all DCHI ports if x not specified
STAT MON (x)	Display the incoming and outgoing monitoring status of D-channel x or all D-channels if x not specified.
STAT SERV (X)	Get status of service messages on D-channel x or all D-channels if x not specified
TEST 100 x	Perform interrupt generation test on DCHI x
TEST 101 x	Perform loop back mode test on DCHI x
TEST 200 x	Perform interrupt handler test on DCHI x (not supported on Option 11)
TEST 201 x	Test interrupt handler-to-link interface path (not supported on Option 11)

D-channel commands (Release 18 & later)

The following commands are used to enable, disable, test and get the status of a D-channel. Refer to the LD 96 introduction for details on the use of these commands.

Note: In X11 Release 18 and later, all commands now accept “DCH” instead of “DCHI.” For example: use “ENL DCH x” instead of “ENL DCHI x.” The STAT DCH and STAT DCHI commands have been combined to STAT DCH.

DIS AUTO x	Disable automatic recovery for DCH x
DIS DCH x	Disable DCH x
DIS MSGI x (options)	Disable the monitoring of incoming messages on D-channel x
DIS MSGI x FEAT CPNW	Disable incoming monitoring for the Network CPNW ISDN messages on D Channel x.
DIS MSGO x (options)	Disable the monitoring of outgoing messages on D-channel x
DIS MSGO x FEAT CPNW	Disable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.
DIS SERV x	Disable service messages on D-channel x
DLIF DCH x	Force download of D channel x (For PRI UIPE application)
ENL AUTO x	Enable automatic recovery for DCH x
ENL DCH x (FDL)	Enable DCH x and attempt to establish the link, and force download to MSDL
ENL MSGI x (options)	Enable the monitoring of incoming messages on D-channel x
ENL MSGI x FEAT CPNW	Enable incoming monitoring for the Network CPNW ISDN messages on D Channel x.
ENL MSGO x (options)	Enable the monitoring of outgoing messages on D-channel x
ENL MSGO x FEAT CPNW	Enable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.
ENL SERV x	Enable service messages on D-channel x
EST DCH x	Establish multiple frame operation on D-channel x
EST ISPC I ch (N)	Start the data interface establishment process at the ISPC slave side an ISPC link (where “N” = the “number of tries” counter)
FDIS NCAL <DCH#> <conn_ID>	Force disconnect the specified call-independent connection
PLOG DCH x	Print protocol error log on DCH x
RLS DCH x	Release D-channel x
RLS ISPC I ch	Stop the data interface establishment process
RST DCH x	Reset D-channel x, inhibit signaling

RST MON	Reset or reactivate monitoring on D-channels with enabled monitors
SDCH DCH x	Switch to the standby D-channel x
SET MSGI x MON (0)-2	Set monitor output format level for incoming messages on D-channel x
SET MSGO x MON (0)-2	Set monitor output format level for outgoing messages on D-channel x
STAT DCH (x)	Get status of one or all D-channels
STAT ISPC l ch	Get status of data interface establishment process at ISPC slave side ISPC link which has been configured to convey D-channel signaling
STAT NCAL <DCH#>	List all current call-independent connections on a given PRI D-channel.
STAT NCAL <DCH#> <conn_ID>	List information pertaining to a specific call-independent connection
STAT MON (x)	Display the incoming and outgoing monitoring status of one or all D-channels.
STAT SERV (x)	Get the enable/disable status of services messages for one or all D-channels
TEST 100 x	Perform interrupt generation test on DCH x
TEST 101 x	Perform loop back mode test on DCH x
TEST 200 x	Perform interrupt handler test on DCH x (not supported on Option 11)
TEST 201 x	Test interrupt handler-to-link interface path (not supported on Option 11)

Multipurpose Serial Data Link (MSDL) commands

The MSDL commands are listed below, **x** is the MSDL device number (defined by prompt DNUM in LD 17). These commands are also provided in Input/Output Diagnostic (LD 37) and Link Diagnostic (LD 48).

DIS MSDL x (ALL)	Disable MSDL device x
ENL MSDL x (ALL, FDL)	Enable MSDL device x
RST MSDL x	Reset MSDL device x
SLFT MSDL x	Invoke self-test for MSDL device x
STAT MSDL (x [FULL])	Get MSDL status

Note: See “Alphabetical List of commands” in LD 48 for a complete description of these commands.

Multipurpose Serial Data Link D-channel commands

The following commands are only available for D-channels on an MSDL port.

DIS LLB x	Disable local loop back mode on MSDL DCH x
DIS RLB x	Disable remote loop back mode on MSDL DCH x
DIS TEST x	Disable TEST mode on MSDL DCH x
DLIF DCH xx FDL	Force download a PRI interface table.
ENL LLB x	Enable local loop back mode on MSDL DCH x
ENL RLB x	Enable remote loop back mode on MSDL DCH x
ENL TEST x	Enable TEST mode on MSDL DCH x
MAP DCH x	Get physical address and switch settings for D-channels
PCON DCH x	Print configuration parameters on MSDL DCH x
PMES DCH x	Print incoming layer 3 messages on MSDL DCH x
PTRF DCH x	Print traffic report on MSDL DCH x
PTRF DCH x	Print traffic report on MSDL DCH x
TEST LLB x	Start local loop back test on MSDL DCH x
TEST RLB x	Start remote loop back test on MSDL DCH x

Alphabetical list of commands

Command	Description	Pack/Rel
DIS AUTO x	Disable automatic recovery for DCH x	pra-13
DIS DCH x	Disable DCH x. This changes the status of the DCH to DSBL and the status of the D-channel to DCH RST (reset). In X11 Release 17 and earlier, the command format is: DIS DCHI x.	pra-18
DIS DCHI x	Disable DCHI x. This changes the status of the DCHI card to DSBL and the status of the D-channel to DCH RST (reset).	pra-13
DIS LLB x	Disable local loop back mode on MSDL DCH x. See "ENL TEST" command for details.	msdl-18
DIS MSGI x	Disable the monitoring of all incoming messages from D-channel x.	pra-13
DIS MSGI x (options)	Disable the monitoring of all incoming messages from D-channel x. The available options are: 1. CH loop channel: disable incoming messages on B-channel loop channel (non-Option 11 systems) 2. CH card channel: disable incoming messages on B-channel card channel (Option 11 systems) 3. CH l s c u: disable incoming messages on ISL-channel loop shelf card unit (non-Option 11 systems) 4. CH c u: disable incoming messages on ISL-channel card unit (Option 11 systems) 5. FEAT feature: disable incoming messages for a PRI feature 6. MSG msg1 msg2 msg3: disable incoming message types Refer to the LD 96 introduction for details.	pra-17
DIS MSGI x FEAT CPNW	Disable incoming monitoring for the Network CPNW ISDN messages on D Channel x.	basic-21
DIS MSGO x	Disable the monitoring of outgoing messages from D-channel x.	pra-13

DIS MSGO x (options)	Disable the monitoring of outgoing messages from D-channel x. Refer to DIS MSGI x (options) for the list of options.	pra-17
DIS MSGO x FEAT CPNW	Disable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.	basic-21
DIS RLB x	Disable remote loop back mode on MSDL DCH x. See “ENL TEST” command for details.	msdl-18
DIS SERV x	Disable service messages on D-channel x. See “ENL SERV” for details. The D-channel must be disabled before disabling service messages.	pra-15
DIS SSM x y	Disable Supplementary Service Monitor for feature y on D-channel x. Only the NAS supplementary service is included (service identifier = 3)	
DIS TEST x	Disable TEST mode on MSDL DCH x. See “ENL TEST” command for details. When the test mode state is disabled, the DCH link will go back to release state and the DCH background audit will then try to establish the link.	msdl-18
DLIF DCH x	Force download of D channel x (For PRI UIPE application). Note that : 1. D channel specified must use the UIPE application 2. D channel must be disabled 3. D channels configured on the same MSDL card using the same interface must be disabled	uipe-20
DLIF DCH xx FDL	Force download a PRI interface table. To download the ISDN interface cable: 1. the D channel must be disabled 2. the UIPE application must be active 3. other D channels on the same MSDL card must be disabled	qsig-22

DWNL DCHI x (t)	Down load layer 3 message configuration table t and LAPD parameters from DCHI x. If table t is not specified, all table information is shown. This command is intended as a debugging tool for system designers.	pra-13
ENL AUTO x	Enable automatic recovery for DCH x. Automatic recovery is initially enabled.	pra-13
ENL DCH x (FDL)	Enable DCH x and attempt to establish the link, and force download to MSDL. A self-test on the DCH runs automatically. If successful, then: • DCHI status: OPER • DCH status: EST If this is not successful, then: • DCHI status: OPER • DCH status: RLS FDL forces D-channel loadware to the MSDL card. This is optional. In X11 Release 17 and earlier, the command format is: ENL DCHI x.	msdl-18
ENL DCHI x	Enable DCHI port x. A self-test on the DCHI card runs automatically. If successful, then: • DCHI status : OPER • DCH status: EST If test is not successful, then: • DCHI status: OPER • DCH status: RLS	pra-13
ENL LLB x	Enable local loop back mode on MSDL DCH x. See “ENL TEST” command for details.	msdl-18
ENL MSGI x	Enable the monitoring of all incoming messages from D-channel x.	pra-13

ENL MSGI x (options)	Enable the monitoring of all incoming messages from D-channel x. Refer to DIS MSGI x (options) for the list of options.	pra-17
ENL MSGI x FEAT CPNW	Enable incoming monitoring for the Network CPNW ISDN messages on D Channel x.	basic-21
ENL MSGO x	Enable the monitoring of all outgoing messages for D-channel x.	pra-13
ENL MSGO x (options)	Enable the monitoring of all outgoing messages for D-channel x. Refer to DIS MSGI x (options) for the list of options.	pra-17
ENL MSGO x FEAT CPNW	Enable outgoing monitoring for the Network CPNW ISDN messages on D Channel x.	basic-21
ENL RLB x	Enable remote loop back mode on MSDL DCH x. See "ENL TEST" command for details.	msdl-18
ENL SERV x	Enable service messages on D-channel x. "Service" and "Service Acknowledge" messages are supported on individual PRA B channels, ISL channels and D-channels. They are used to coordinate channel status between the near and far end. A channel status can be in service, maintenance or out-of-service. The primary and backup D-channel must be disabled before enabling service messages. Make sure both ends support service messages before using this command. For Meridian 1/Meridian SL-1 to Meridian 1 / Meridian SL-1, both systems must have X11 Release 15 or higher.	pra-15

By default, SERV is disabled when the interface type is Meridian 1/Meridian SL-1 (LD 17 IFC = SL1).

When enabled, service messages are supported on individual PRA B-channels, ISL channels and D-channels. When disabled, service messages are provided automatically on D-channels with Backup D-channel configured.

For Meridian 1/Meridian SL-1 to DMS, or Meridian 1/Meridian SL-1 to AT&T only service messages on individual PRA B-channels and ISL channels are supported.

By default, SERV is disabled when the interface type is DMS (LD 17), and enabled when the interface type is AT&T (LD 17 IFC = ESS4/ESS5).

ENL SSM x y	Enable Supplementary Service Monitor for feature y on D-channel x, where: y = 3 for Network Attendant Service. All other entries are reserved for future use	nas-18
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Output format is as follows:

Standard ISDN message monitor output format appended with four fields.

Where:

- Field 1 = Customer number
- Field 2 = Indicator of whether the message is one that was decoded at a "tandem" node
- Field 3 = Descriptive string about a specified item
- Field 4 = Numeric information about specified item

Examples of the four fields follow:

```
--> 002 T-ACCESS TRKINFO
--> 002 T-PRIVATE TRUNK
--> 002 T-TIE TRUNK
--> 002 T-TANDEM COUNT (000001)
```

ENL TEST x Enable TEST mode on MSDL DCH x. msdl-18

The DCH is put into TEST mode to perform the local loop back (LLB) or remote loop back (RLB) test. The DCH link can only be put in test mode if it is in the release or established state. If the link is in establish state, the DCH link is first released, and then put in test mode.

The local loop back test first tests the expedited interface, then the ring interface. The test consists of sending a data packet through each interface, which in turn is sent back by Layer 2. This data packet is then validated to ensure that the contents of the data packet are the same that were originally sent.

Example:

- ENL TEST x enter TEST mode
- ENL LLB x enter local loop back mode
- TEST LLB x perform test (results are PASS or FAIL)
- DIS LLB x exit local loop back mode
- DIS TEST x exit TEST mode and restore link

The remote loopback test is used to verify the integrity of the physical link. This following test is only supported if both the D channels are on the MSDL card and both switches are running Release 18 or above. To run the test the far-end must be in the remote loopback mode (ENL RLB x). The DCH running the test (near-end) must be in TEST mode.

Example:

Far-end:

ENL TEST x — enter TEST mode
ENL RLB x — enter remote loopback mode
DIS RLB x — exit remote loopback mode (after test)
DIS TEST x — exit TEST mode and restore link

Near-end:

ENL TEST x — enter TEST mode
TEST RLB x — perform test (results are PASS or FAIL)
DIS TEST x — exit TEST mode and restore link

If the far end is not an MSDL D-channel, use the RLBK command in LD60 to set up the remote loopback test.

EST DCH x	Establish multiple frame operation on D-channel x. With the absence of the back-up D-channel, issuing the EST DCH x command clears all the B-channels on loop x. If backup D-channel is available, the system switches to the backup D-channel and the B-channels of loop x are not cleared.	pra-13
EST ISPC l ch (N)	Establish data interface process at the ISPC SLAVE side of an ISPC link at loop (l) and channel (ch), where "N" = the "number of tries" counter. The range for N = 0-(1)-255. When N = 0, the mode is set to AUTOMATIC. This mode requires one TDS slot and one DTR unit. This mode is not recommended for use on small systems or systems loaded with heavy traffic. When N > 0, the process is activated for a period of up to N * 30 minutes. The available range goes from 30 minutes (N = 1) to 128.5 hours or 5 days (N = 255). If no value is entered for N, it defaults to a value of 1. When N = 1, one attempt will be made to establish the data interface process before the ISPC slave D-channel is released.	ispc-22
FDIS NCAL <DCH#> <conn_id>	Force disconnect the specified call-independent connection as defined by its connection ID number. The connection ID number is a number in the range of 1-9999 that identifies the call independent connection on a given DCH.	qsig gf-22
MAP DCH x	Get physical address and switch settings for D-channels. This command outputs the card name and switch settings for D-channels. For example: <pre>MAP DCH DCH 15 DCHI 07 DCH 23 MSDL 09 PORT 2</pre>	msdl-18

PCON DCH x Print configuration parameters on MSDL DCH x. This command outputs the parameters originally downloaded when the D-channel was enabled. The output format is: msdl-18

DCH : x LINK PARAM CONFIRM TIME: hh:mm:ss

- MSDL x = 0-15
- PORT x = 0-3
- INTERFACE aaa = SL1, D100, D250, ESS4, S100, etc.
- OPER MODE aaa bbb ccc ddd eee

Where: aaa = RS422, RS232 ; bbb = DTE, DCE ; ccc = USR, NET ; ddd = baud rate ; eee = clock (EXT or INT CLK)

T200 xx (LAPD parameter)

T203 xx (LAPD parameter)

T200 xx (LAPD parameter)

N201 xx (LAPD parameter)

K xx (LAPD parameter)

N2X4 xx (LAPD parameter if INTERFACE is ITR6)

PLOG DCH x Print protocol error log-on DCH x. pra-18

Protocol errors can be the result of PRI transmission problems and re-start procedures, or a protocol mismatch with the far end. The PLOG counters are cleared after the PLOG is printed or the DCH card is enabled.

In X11 Release 17 and earlier, the command format is:

- PLOG DCHI x

When a protocol counter overflows, the PLOG is printed automatically and the counters are cleared. The counter is also cleared when the D-channel is disabled.

Response in X11 *Release 17* and earlier is:

DCH xx I xxxx

yy zz 01 02 03...16

Response for MSDL DCH in X11 *Release 18* and later is:

DCH : xx MAINT CONFIRM TIME: hh:mm:ss

01 cc

11 cc

23 cc

Where:

- x = DCH number
- xxxx = system real time (in hexadecimal)
- yy = maintenance indication primitive
- zz = maintenance indication task ID
- 01 02 03 . . . 16 = protocol error counters as listed below
- cc = protocol error counts

In X11 Release 18 and later, only the non-zero counters are output. Protocol error counters:

- 01 = Count of missing PRI handshakes
- 02 = Count of peer initiated re-establishment link
- 03 = Count of unsuccessful retransmit N200 of SABME
- 04 = Count of unsuccessful retransmit N200 of DISC
- 05 = Count of N(R) errors
- 06 = Count of I fields with length greater than N201
- 07 = Count of undefined frames
- 08 = Count of I fields but not allowed
- 09 = Count of FRMR frames
- 10 = Count of CRC error frames
- 11 = Count of REJ frames
- 12 = Count of messages with less than 4 octets
- 13 = Count of undefined protocol discriminators
- 14 = Count of undefined message types
- 15 = Count of messages missing mandatory information elements
- 16 = Count of messages with undefined information elements
-
- 17 = Count of layer 1 reports of no external clock being received
- 18 = Count of aborted frames
- 19 = Count of SABME frames received with incorrect C/R bit
-

- 20 = Count of supervisory frames received with F = 1
- 21 = Count of unsolicited DM responses with F = 1
- 22 = Count of unsolicited UA responses with F = 1
- 23 = Count of unsolicited UA responses with F = 0
- 24 = Count of DM responses with F = 0
- 25 = Number of times that no response was received from the far end after N200 retransmissions of RR or RNR
- 26 = Count of frames received with incorrect header length
- 27 = Number of times owner receiver busy condition was entered
- 28 = Number of times peer receiver busy condition was entered
- 29 = Count of messages with call reference length greater than 2
-
- 30 = Count of optional IEs received with invalid contents
- 31 = Count of mandatory IEs received with invalid contents
- 32 = Count of messages received with IE's not ordered correctly
- 33 = Count of IEs which were repeated in received messages, but are only allowed to appear once per message
- 34 = Count of IEs received with length exceeding the specified maximum length for the IE
- 35 = Count of layer 3 messages from far-end with invalid call reference flag value of 0.
- 36 = Count of layer 3 messages from far-end with invalid call reference flag value of 1.
- 37 = Count of layer 3 messages from far-end with invalid global call reference.
- 38 = Count of layer 3 messages from SL-1 that are too short.
- 39 = Count of layer 3 messages from SL-1 containing an undefined message type.
-
- 40 = Count of layer 3 messages from SL-1 missing mandatory IE(s).
- 41 = Count of layer 3 messages from SL-1 containing unsupported IE(s).
- 42 = Count of layer 3 messages from SL-1 containing invalid operational IE(s).

- 43 = Count of layer 3 messages from SL-1 containing invalid mandatory IE(s).
- 44 = Count of layer 3 messages from SL-1 with IE(s) out of order.
- 45 = Count of layer 3 messages from SL-1 containing repeated IE(s).
- 46 = Count of layer 3 messages from far-end with an invalid call reference length.
- 47 = Count of layer 3 messages from SL-1 with an invalid call reference flag value of 0.
- 48 = Count of layer 3 messages from SL-1 with an invalid call reference flag value of 1.
- 49 = Count of layer 3 messages from SL-1 with an invalid global call reference.
-
- 50 = Count of unexpected layer 3 messages received from the far-end.
- 51 = Count of unexpected layer 3 messages received from the SL-1.
- 52 = Count of unexpected layer 3 timer expirations.
- 53 = Count of protocol messages received when D-channel is not in service or waiting for a Service Acknowledge message.
-

PLOG DCHI x Get D-channel protocol statistics log for DCHI x.

pra-13

Protocol errors can be the result of PRI transmission problems and restart procedures, or a protocol mismatch with the far-end.

The PLOG counters are cleared after the PLOG is printed or the DCHI card is enabled. When a protocol counter overflows, the PLOG is printed automatically and the counters are cleared.

Response is:

- DCH x I xxxx yy zz 01 02 03. . . 16

Where:

- x = DCHI port
- xxxx = system real time (in hexadecimal)
- yy = maintenance indication primitive
- zz = maintenance indication task ID
- 01 02 03. . . 16 = protocol error counters as listed below:

- 01 = count of missing PRI handshakes
- 02 = count of peer initiated re-establishment link
- 03 = count of unsuccessful retransmit N200 of SABME
- 04 = count of unsuccessful retransmit N201 of DISC
- 05 = count of N(R) errors
- 06 = count of I fields with length greater than N201
- 07 = count of undefined frames
- 08 = count of I fields but not allowed
- 09 = count of FRMR frames
-
- 10 = count of CRC error frames
- 11 = count of REJ frames
- 12 = count of messages with less than 4 octets
- 13 = count of undefined protocol discriminators
- 14 = count of undefined message types
- 15 = count of messages missing mandatory info. elements
- 16 = count of messages with undefined information elements
-

PMES DCH x Print incoming layer 3 messages on MSDL DCH x. msdl-18

The following data is kept by the MSDL DCH loadware and output when requested by this command or when one of the counters overflows:

```
DCH : xx
MSG LOG CONFIRM TIME: hh:mm:ss

SETUP:      yy
CONNECT:    yy
ALERT:      yy
```

(Only non-zero counters are reported) (Where yy is the number of times a message was received)

When a counter overflows, the log is printed automatically and the counters are cleared. The counter is also cleared when the D-channel is disabled.

PTAB DCHI x (t) Display layer 3 message configuration table t and LAPD parameters from DCHI x. This command is intended as a debugging tool for system designers. pra-13

PTRF DCH x	Print traffic report on MSDL DCH x. The following traffic information is output: 1. PEAK_I_US xx % = peak incoming usage on the DCH link 2. AVRG_I_US xx % = average incoming usage on the DCH link 3. PEAK_O_US xx % = peak outgoing usage on the DCH link 4. AVRG_O_US xx % = average outgoing usage on the DCH link 5. TIME xx = time in seconds 6. CONNECTED CALLS xx: = total number of established call-independent connections	msdl-18
RLS DCH x	Release D-channel x. The link is in a waiting state, ready to come back up at any time. If you release the D-channel with active B-channels, then calls in progress are not affected. However, these calls are disconnected when you re-establish the D-channel. When the automatic recovery feature is active, the B-channels are automatically re-established	pra-13
RLS ISPC l ch	Stop the data interface establishment process. When this command is entered, the mode becomes MANUAL and the number of attempts to be performed = 0.	ispc-22
RST DCH x	Reset D-channel x, inhibit signaling. Forces the link to reset (RST) state, but does not disable PRI or DCH	pra-13
RST MON	Reset or reactivate monitoring on D-channels with enabled monitors.	pra-17
SDCH DCH x	Switch to the standby D-channel x. This is only valid in a backup D-channel configuration. Releases a D-channel and switches over to the other D-channel as long as the other D-channel is in EST STBY, established standby mode. Where x is the standby D-channel number. This command changes the status of the active D-channel to standby, and changes the status of standby D-channel to active.	pra-13

This command is not applicable if the recovery to primary D-channel option (prompt RCVP = YES in LD 17) is used.

This command is only applicable to Meridian 1/Meridian SL-1 to Meridian 1/Meridian SL-1 Backup D-channel interface (IFC = SL-1 in LD 17).

SET MSGI x MON (0)-2 pra-17
 Set monitor output format level for all incoming messages on D-channel x. Refer to Setting output format levels earlier in the section.

SET MSGO x MON (0) -2 pra-17
 Set monitor output format level for all outgoing messages on D-channel x. Refer to Setting output format levels earlier in the section.

STAT DCH x pra-13
 Get the present status of D-channel x, where x is the I/O port number (entering x to specify just one link is optional).

DCH status may be:

- EST = DCH link is established
- EST STBY = DCH link is established and is the standby
- FAIL = DCH link has failed
- RLS = DCH link is released
- RST = DCH link is in reset state
- AEST, ARLS, REST = these codes indicate intermediate background functions are being performed. Enter the STAT command again to determine final status.

STAT DCH (x) pra-18
 Get status of one or all D-channels.
 If a DCH number is not entered, the status of all D-channels is output. The output format is:

DCH x : aaaa bbbb cccc dddd x

Where:

- x = DCH number
- aaaa = application status
- bbbb = link status
- cccc = AUTO if autorecovery is enable
- dddd = BKUP x or PRIM x (associated primary or backup DCH)

Application status (aaaa):

- APRI = Awaiting PRI response
- CPRI = Checking PRI
- DIAG = application has failed
- DSBL = application is disabled
- OPER = link is operational
- RST = application is in reset state
- SDCH = Setting D-channel

Link status (bbbb):

- AEST = Awaiting establishment
- ARLS = Awaiting release
- EST ACTV = DCH link is established and active
- EST STBY = DCH link is established and is the standby
- FAIL = DCH link has failed
- REST = request establishment
- RLS = DCH link is released
- RST = DCH link is in reset state
- TST = Test mode

In X11 Release 17 and earlier, the STAT DCHI command is required to get the application status.

STAT DCHI (x) Get the present status of DCHI x (entering x to specify just one card, is optional). DCHI status may be: pra-13

1. DSBL = DCHI hardware is disabled.
2. DIAG = DCHI hardware has failed.
3. OPER = DCHI hardware is operational.
4. RST = DCHI is in reset state.
5. PRI, CPRI, SDCH = these codes indicate intermediate background functions are being performed. Enter the STAT DCHI command again to determine final status.

STAT ISPC I ch Get status of data interface establishment process at an ISPC SLAVE side of an ISPC link (where I = loop and ch = channel) which is configured to convey D-channel signaling. ispc-22

The status may be:

1. DISABLED = ISPC link is disabled
2. AWAITING ESTABLISHMENT = the data interface establishment process is waiting to receive DTMF digits. While waiting, dial tone is provided to the ISPC link at the SLAVE side.
3. RELEASED = the data interface establishment process is stopped because either an "RLS ISPC" command has been entered or because the maximum number of tries has been reached.
4. ESTABLISHED = data interfaces at both ends of the ISPC link are established.
5. AWAITING RELEASE = the ISPC link is being disconnected. Once disconnected, the link will transition to the "RELEASED" state.

The mode may be:

1. MODE MANUAL N = the data interface establishment process is running with up to "N" number of tries
2. MODE AUTOMATIC = the Meridian 1 provides dial tone to the ISPC slave D-channel.

STAT MON (x) Display the incoming and outgoing monitoring status of one or all D-channels. pra-13

STAT NCAL <DCH#>

qsig gf-22

List all current call-independent connections on a given PRI D-channel.

The response format is as follows:

- **NCAL CONN_ID:** The connection ID number is a number in the range of 1-9999 that identifies the call independent connection on a given DCH.
- **CREF:** call reference number in HEX identifying independent connection
- **STATE:** current state of all call-independent connections (IDLE, CONN_REQ, CONN_EST)
- **TIME:** year month day hour:minute:second (the time when call independent connection request is made)
- **APPL:** applications using the call-independent connection (eg. NACD, NMS, ...)
- **ORIG:** originator
- **DEST:** destination

STAT NCAL <DCH#> <conn_ID>

qsig gf-22

List information pertaining to a specific call-independent connection as defined by its connection ID number.

The response format is as follows:

- **NCAL CONN_ID:** The connection ID number is a number in the range of 1-9999 that identifies the call independent connection on a given DCH.
- **CREF:** call reference number in HEX identifying independent connection
- **STATE:** current state of all call-independent connections (IDLE, CONN_REQ, CONN_EST)
- **TIME:** year month day hour:minute:second (the time when call independent connection request is made)
- **APPL:** applications using the call-independent connection (eg. NACD, NMS, ...)
- **ORIG:** originator
- **DEST:** destination

STAT SERV (x) Get the enable/disable status of services messages for one or all D-channels. See "ENL SERV" for details.

pra-15

TEST 100 x	Perform interrupt generation test on DCHI x. This is an isolated hardware test. If this test fails, either a faulty DCHI card or a contention problem is indicated. Tests 100, 101, 200, and 201 must be run in sequential order. Established calls will stay up, but new calls cannot be placed. The DCH link must be in the reset (RST) state when these tests are run. Reset (RST) can be established when the status of the D-channel is established (EST) or released (RLS).	pra-13
TEST 101 x	Perform loop back mode test on DCHI x. This is an isolated hardware test. If this test fails, either a faulty DCHI card or a contention problem is indicated.	pra-13
TEST 200 x	Perform interrupt handler test on DCHI x. This is a software test which, when failed, indicates software problems. (Not supported on Option 11)	pra-13
TEST 201 x	Test interrupt handler-to-link interface path. This is a software test which, when failed, indicates software problems. (Not supported on Option 11)	pra-13
TEST LLB x	Start local loop back test on MSDL DCH x. See “ENL TEST” command for details.	msdl-18
TEST RLB x	Start remote loop back test on MSDL DCH x. See “ENL TEST” command for details.	msdl-18
